

Agricultural Research Institute, Pusa

ON FLAX DODDER

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THE dodders are a genus of leafless parasitic flowering plants belonging to the order of Bindweeds (*Convolvulacæ*), the stems of which consist of thin thread-like structures which twine round the plant destined to be the foster-parent or host. The parasite obtains its nutriment from the host-plant by means of numerous suckers which penetrate the tissues of the foster-parent and which serve both as organs of attachment and as the means by which the sap of the host-plant is absorbed for the benefit of the dodder. Plants attacked by dodders are invariably checked in growth, and in the case of some cultivated plants these parasites are important agricultural pests.

Great damage is done to such crops as clover, lucerne and flax in Europe (1,2) and North America by dodders, and in all cases the loss is due to the seeds used in raising these crops being mixed with dodder seeds. Great care is now taken in these countries to obtain dodder-free seed, and seed merchants, as a rule, take pains to ensure the purity of their seeds. The best farmers in England and the Continent only sow clover seeds which are guaranteed free from dodder.

As all the members of the genus which are of Agricultural importance are annuals and grow only from seeds it is possible by proper care to greatly limit the damage done by these pests. The flowers are borne in globular clusters on the tendril-like stems, and in most cases the seeds ripen at the same time as those of the host-plant and are thus harvested together. Recent researches (3) have shown that in the case of some of the dodders, including flax-dodder, even immature seeds will readily germinate and infect the crops with which they are sown.

Indian Species.—Seven species of dodder (*Cuscuta*) are described in the Flora of British India (4), but most of these are only found in

the hills at considerable elevations. One species only (*Cuscuta reflexa*, Roxb.) (5) is common in the plains, and this does not appear to be parasitic on any important agricultural crops and is often to be seen in abundance on *babul* trees (*Acacia arabica*, Willd.). A species of dodder has been observed on lucerne to a small extent in the Chenab Colony of the Punjab. India is therefore almost free from a group of pests of considerable importance in Europe and North America, and it is hoped that great care will be taken not to introduce any of these parasites which attack crops into the country.

Flax dodder.—(*Cuscuta Epilinum*, Weihe) is a common parasite on flax in Europe and North America and appears to have been introduced into England (6,7,8) with the cultivation of that plant. It is said to grow exclusively on flax in Europe and Russian Asia and to be particularly plentiful in consignments of flax seed exported from Odessa (7). Although linseed is an important Indian oil-seed crop, nevertheless I can find no references to dodder occurring on this plant in India.

The introduction of flax-dodder into Behar.—During the past rabi crop (1908) my attention was arrested by the occurrence of dodder in a field of Riga flax in Behar which had been grown for fibre purposes from one year acclimatised Russian seed. The parasite was determined and found to agree in all respects with the flax-dodder of Europe and to be botanically identical with *Cuscuta Epilinum*, Weihe. Moreover the seed of the parasite and host ripened together, and from the general vigour of the dodder there seemed to be no doubt that this pest would thrive under Indian conditions and might easily spread to the country varieties of linseed grown for seed. So far, however, the parasite has only been found on two estates in Behar, and in each case the original source of the seed was the same, namely, a European consignment of flax imported by a planter for fibre purposes. In the first year dodder was not noticed, but in the second year it was discovered by me on one of the two estates referred to.

In view of the fact that attempts are being made to establish a flax industry in Behar and that flax trials are being made on some of the Government farms in India, a circular letter (Appendix A) was at once issued to all the Directors of Agriculture in India, and the local Planters' Association at Mozafferpore was warned of the danger. It is hoped that by this means steps will have been taken to immediately stamp

out the pest in India and to prevent its re-introduction in the future. Should this pest ever get established on the country varieties of linseed it would be impossible to control it.

Description of the parasite.—In order to assist in the identification of this pest in India it appears desirable to give a short description of the parasite. In fig. 1 of the plate appended to this article is shown a portion of a flax plant attacked by dodder. The thread-like stems and globular clusters of flowers of the dodder are clearly shown, while the details of the flowers, which are of botanical interest and which are necessary for the correct determination of the plant, are given in figs. 2 to 6.

The dodder seeds are such smaller than those of flax and could be readily separated therefrom by a suitable screening machine. They contain a thin curved embryo and germinate on the damp earth some time after the linseed is sown (9). At first the seeds put forth a club-shaped root-like body into the earth and then the embryo elongates feeding on the reserve materials of the seed which is now carried on the tip of the filament into the air. Ultimately the seed is cast off, and the above-ground portion of the small dodder plantlet begins to revolve from right to left as if in search of a support. If by this means it comes in contact with a young linseed plant the dodder quickly twines round the host-plant, develops suckers which penetrate into the tissues of the linseed and absorbs food-materials therefrom. As soon as this takes place, the root of the dodder dies away, and the parasite loses all connection with the soil. It rapidly branches however and quickly spreads to other linseed plants near and in future lives entirely at the expense of the host. The growth of the flax crop is consequently checked, and in many cases the host-plants are practically killed out.

Prevention and Remedies.—Generally speaking prevention is much better than cure, and this is particularly true with regard to flax-dodder. It is very much easier by proper safeguards to prevent the introduction of this parasite into India than to stamp it out after it is once established. Its introduction can be prevented by importing European or American linseed for fibre and seed purposes only through well-known and reliable seed merchants and by obtaining a guarantee that such seed is free from dodder seeds (*vide* Appendix B). Indeed in all cases where seeds are introduced for trial in India

care should be taken to guard against introducing at the same time the parasites which are known to occur on the crop in the country of origin.

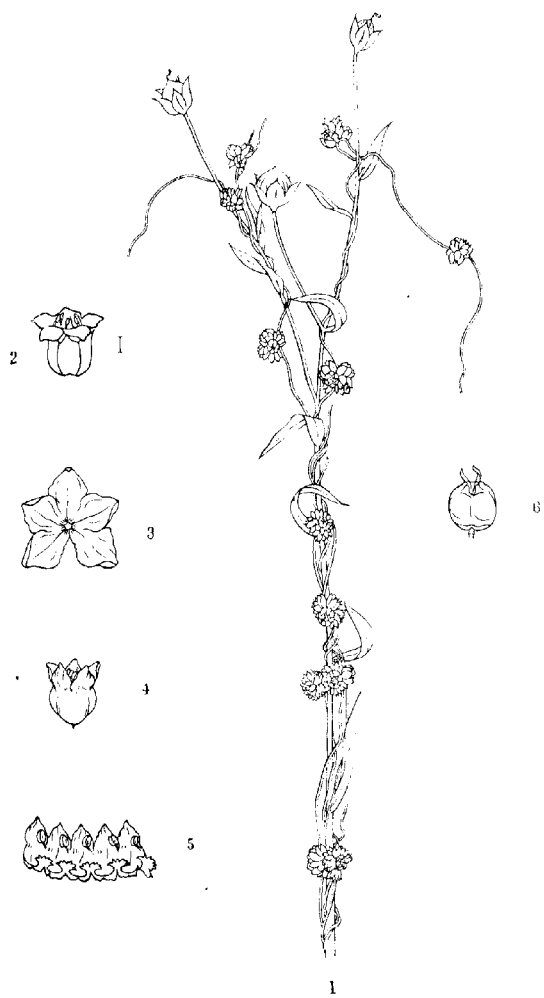
If unfortunately, as in this case, the pest has been introduced, the best means of combating it is to burn the linseed crop with the dodder on the ground, if possible, before seed has been formed. Cultivators' fields of linseed near should be kept under observation and bought up and the crop destroyed if the pest is found on them. Under no circumstances should seed be sown from infected plots, and such land should not again be sown with linseed for two years. For the present, flax seed from Behar should not be sown in other parts of India until it is definitely known that this pest has been eradicated.

List of papers cited.

- 1.—*Kirchner*.—Die Krankheiten und Beschädigungen unserer landwirtschaftlichen Kulturpflanzen, 1890. s. 449.
- 2.—*Wagner*.—Deutsche Flora. Zweite Auflage. s. 535.
- 3.—*Kinsel*.—Landw. Vers. Stat. 54 (1900) Nos. 1-2, pp. 125—132.
- 4.—*Hooker*.—Flora of British India, 1885, Vol. IV, p. 225.
- 5.—*Wain*.—Bengal Plants, 1903. Vol. 2, p. 723.
- 6.—*Bentham & Hooker*.—Hand-book of the British Flora, 1896, p. 306.
- 7.—*Babington*.—Journal of the Royal Agricultural Society of England, Vol. 2, 1845, p. 63.
- 8.—*Lindley & Moore*.—Treasury of Botany, 1889, Part 1, p. 364.
- 9.—*Kerner & Oliver*.—Natural History of Plants, 1894, Vol. 1, p. 172.

Description of plate.

- FIG. 1.—The upper portion of a Riga flax plant attacked by dodder.
 „ 2.—A single flower of flax-dodder. The line near shows the natural size of the flower.
 „ 3.—The complete calyx of a dodder flower.
 „ 4.—The flower with calyx removed.
 „ 5.—The complete corolla seen from within with scales below.
 „ 6.—The pistil with free styles.



APPENDIX A.

Circular letter, dated 25th February 1908, from the Imperial Economic Botanist to all Directors of Agriculture.

I have the honour to draw your attention to the fact that a dangerous parasitic flowering plant—*Cuscuta Epilinum*, Weihe—known in England as Flax Dodder has been introduced into Behar in the consignments of Flax seed from Europe imported for fibre purposes. Flax Dodder is said to grow exclusively on Flax in Europe and Russian Asia. As far as I have been able to ascertain, it does not occur on the indigenous varieties of linseed cultivated in India. It will be apparent, therefore, that there is a danger of the spread of this parasite from fields sown with imported flax seed to cultivators' fields. A calamity of this nature would probably do great harm to an important oil-seed industry in India. Once Flax Dodder got established in the cultivators' fields it would be quite impossible to control the pest.

I beg to suggest that any plots sown on the Experimental Farms in your Province with linseed for fibre purposes from seed introduced from Behar or from Europe or other localities outside India be kept under observation. Should the parasite make its appearance the only safe way to destroy the Flax Dodder is to burn the crop on the ground and so destroy the dodder seeds. In the event of an outbreak on the farms, I would suggest the cultivators' linseed near be kept under observation to see if the pest has spread.

A full report of this pest, with illustrations, is being prepared for publication. In the meantime, please make any use of this letter you think proper.

APPENDIX B.

Demi-official No. 46, dated Pusa, Bengal, the 12th March 1908.

From—A. HOWARD, Esq., Imperial Economic Botanist, Pusa, India,

To—Messrs. Sutton & Sons, Reading, England.

As you are probably aware, attempts are now being made to establish a flax (fibre) industry in Behar and that it is probable that fresh consignments of Russian Riga seed and of other European races may have to be imported from time to time for this purpose. Sufficient care has not hitherto been taken with regard to the seed imported for this purpose from Europe with the result that flax dodder *Cuscuta Epilinum*, Weihe, has been introduced into India. It is hoped however to destroy this dodder and to prevent its spread to the indigenous varieties grown by the cultivators for seed purposes.

I should be glad to know if your firm could send out to India consignments of Russian Riga flax seed guaranteed free from dodder and other weed seeds, and, if so, at what price for large and small consignments.

Dated 15th April 1908.

From—Messrs. SUTTON & SONS, Reading, England,

To—The Imperial Economic Botanist, Pusa, India.

Your enquiry concerning Flax (Demi-official No. 46) has had our careful personal attention, and we have pleasure in offering to supply carefully selected and thoroughly cleaned seed of Riga Flax at 12s. 6d. per bushel on our usual export terms and subject to the seed being unsold on receipt of order.

